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EXAMINER
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YAMNITZKY, MARIE ROSE

ART UNIT	PAPER NUMBER
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1786

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09/28/2010

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/589,183	<b>Applicant(s)</b> KATHIRGAMANATHAN ET AL.	
	<b>Examiner</b> Marie R. Yamnitzky	<b>Art Unit</b> 1786	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 12 August 2006 and 23 March 2007.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 29-48 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 29-48 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 August 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>23 March 2007</u> . | 6) <input type="checkbox"/> Other: _____  |

1. The preliminary amendment filed August 12, 2006, which cancels claims 1-28 and adds claims 29-48, has been entered.

Claims 29-48 are pending.

2. The drawings are objected to because the formulae for TPD and mTADATA as shown in Fig. 8 contain errors (-CH<sub>3</sub> shown in the wrong position on the right side of the TPD formula, and a “floating” CH<sub>3</sub> in the mTADATA formula), and some of the details in Fig. 9a through 17c are not clearly readable (particularly in the inset for each of these figures). Also, in Fig. 4, the “R” that is floating between the first and second formulae (towards the right side), should apparently be shown at the end of the line extending from the lower right benzene ring of the first formula. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner,

the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

3. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as “means” and “said,” should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, “The disclosure concerns,” “The disclosure defined by this invention,” “The disclosure describes,” etc.

4. The abstract of the disclosure is objected to because it does not describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details. Correction is required. See MPEP § 608.01(b).

5. The disclosure is objected to because of the following informalities:

There is no brief description of the drawings.

Page 3, line 17 recites “ $n+2$  is the valency of M”. This same phrase also appears on pages 4-6 (and similar language is in claims 29 and 35-37). This recitation defines “ $n$ ” in formulae that are not shown as having any overall charge. However, based on the nature of the ligands in the formulae, if  $n+2$  is the valency of M, then the complexes represented by the formulae must have an overall charge of +1. For example, when  $n$  is 1, the compounds

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represented by formulae (I)-(III) each have two monoanionic ligands (-2 charge), but the metal valency is 3 if  $n+2$  is the valency of M. When  $n$  is 2 and M is iridium, which is described as a preference, the valency of iridium must be 4 if  $n=2$  is the valency of M. However, the exemplified iridium complexes have three monoanionic ligands and are not charged complexes, so the valency of the iridium in the exemplified complexes is apparently 3 (i.e.  $n+1$ , rather than  $n+2$ ).

The descriptions on pages 4 and 5 with respect to the reactants are not fully consistent with the intended products. The first reactant formula in the two described reactions does not appear to be capable of providing the full scope of “ $n$ ” of the intended products.

The description on page 6 is confusing because reacting a compound of the second formula with a compound of the third formula shown on page 6 would not provide the compound of the first formula. The reactants do not provide the phenylpyridine ligand(s) required for a compound of the first formula on page 6.

Appropriate correction is required.

6. Claims 29-48 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claims contain subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The specification does not enable one of ordinary skill in the art to make compounds of the specified formulae wherein  $n+2$  is the valency of M.

Even if the claims were to define  $n+1$  (rather than  $n+2$ ) as the valency of M, the methods of claims 35 and 36 would be broader in scope than the enablement provided, and the method of claim 37 would not be enabled. The reactants set forth in claim 35 provide only a portion of the intended product, and the reactants set forth in claim 36 provide only a portion of intended product. In the case of claim 37, the reactants set forth in the claim do not provide the intended product.

7. Claims 29-48 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The recitation in claims 29 and 35-37 that “the sum ( $n+2$ ) is equal to the valency of M” is inconsistent with the overall structure of the compounds.

The scope of “halogen groups” as recited in claims 29 and 35-37 is not clear. It is not clear if this terminology refers to halogens, per se, or to any group that comprises a halogen.

The limitations of claim 31 are not fully consistent with the limitations of claim 29. Claim 31 lists possibilities for the R variables, such as aryloxy groups, that do not appear to be within the scope of the R variables as defined in claim 29.

The limitations of claim 31 are also unclear because of the recitation of broad and narrow limitations in the same claim. The phrase “aromatic groups” is a broad limitation with “substituted and unsubstituted phenyl groups....fluorene groups” being a narrower limitation that provides a subset of aromatic groups.

The limitations of claims 32-34 are not consistent with the limitations of claim 29. The R variables as defined in claim 29 do not encompass compounds wherein R<sub>5</sub> and R<sub>6</sub> together form a group as shown in claim 32, and compounds of formula (IV) and (V) as shown in claim 33 and further defined in claim 34 are not within the scope of the compounds of the formulae as defined in claim 29.

Even if claim 29 were to contain language allowing for R<sub>5</sub> and R<sub>6</sub> together to form a group as shown in claim 32, each of formulae (I), (II) and (III) of claim 29 contain the variables R<sub>5</sub> and R<sub>6</sub>. It is not clear if “type (I)” as recited in claim 32 is intended to define a subset of each of formulae (I), (II) and (III), or if type (I) is intended to refer to formula (I). It does not appear to be possible for R<sub>5</sub> and R<sub>6</sub> of formula (III) to form a group as shown in claim 32. If “type (I)” is intended to refer to formula (I), then the limitations of claims 33 and 34 are inconsistent with claim 32 because formula (IV) as shown in claim 33 does not have one or more phenylpyridine ligands as required for the formula (I) compounds.

Formula (V) as shown in claim 33 is also inconsistent with claim 32 because the formula shows “R<sub>3</sub>” in the position where “R<sub>1</sub>” is shown in claim 32.

The variable “M” is not defined in claims 35-37.

The limitations of the method of claim 35 are also unclear because it appears that a compound of the second formula set forth in the claim, if reacted with a compound having the third formula set forth in the claim, would only provide compounds of the first formula in the claim wherein n is 2.

The limitations of the method of claim 36 are also unclear because it appears that a compound of the second formula set forth in the claim, if reacted with a compound having the third formula set forth in the claim, would only provide compounds of the first formula in the claim wherein  $n$  is 1.

Claim 36 defines the variable " $R_2$ ", but this variable is not in any of the formulae in the claim.

The limitations of the method of claim 37 are also unclear because the two compounds which must be reacted with each other per the claim would not provide the intended product.

Claim 37 defines the variable " $R_4$ ", but this variable is not in any of the formulae in the claim.

It is not clear what is meant by an amine "complex" as recited in parts (a) and (b) of claim 40. Page 8 of the specification teaches that the hole transporting material may be an "amine complex such as..." but what follows "such as" would not be considered to be a "complex" as that term is used in conventional chemical terminology.

Part (c) of claim 40 is inconsistent in requiring a film of a "polymer" while including TPD as a member of the Markush group from which the polymer is selected. TPD is not a polymer.

Claim 40 is incomplete in referring to compounds of formulae that are shown in the specification, and compounds of formulae that are shown in the drawings (part (d) of claim 40). The actual formulae need to be set forth and fully defined in the claim.



The limitations of claim 40 are also unclear because of the recitation of broad and narrow limitations in the same claim. For example, part (b) appears to be a subset of part (a) and, disregarding the term “complex” in parts (a) and (b), some of the members of the Markush group in part (c) and some of the members of the Markush group in part (d) represent a narrower scope of (a) and/or (b). As another example, part (f) broadly allows for any conjugated polymer while part (g) defines a narrower subset of conjugated polymers. Within part (g), there are also broad and narrow limitations in first reciting “poly(2,5 dialkoxyphenylene vinylene)”, listing two specific polymers within this broader terminology, and also reciting “other poly(2,5...with at least one...solubilising alkoxy group)” (which is narrower than the initial poly(2,5...) possibility, but broader than the two specific polymers that are poly(2,5...) polymers).

Claim 45 is incomplete in referring to compounds of formulae that are shown in the drawings.

The limitations of claim 46 are inconsistent with the limitations of claim 42. The examiner suggests amending claim 46 to depend from claim 38 and, in line 2 of claim 46, changing “the electron” to --an electron--.

8. For purposes of comparing to the prior art, the examiner interprets the claims as if they require  $n+1$  (rather than  $n+2$ ) to equal the valency of M.

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claims 29-34, 38-44 and 46-48 are rejected under 35 U.S.C. 102(b) as being anticipated by Kathirgamanathan et al. (WO 2004/008554 A2).

Claims other than claims 32-34 are included in this rejection with the expectation that the definition of R<sub>5</sub> and R<sub>6</sub> as set forth in claim 32 is intended to be within the scope of these variables as defined in claim 29, even though claim 29 as presently written does not explicitly allow for the definition set forth in claim 32.

Compound C as represented by the second formula on page 28 of the prior art is an iridium complex of present formulae (I) and (V) wherein R<sub>5</sub> and R<sub>6</sub> of formula (I) form a group of the formula set forth in claim 32, each of R<sub>1</sub>-R<sub>3</sub> on the phenylpyridine ligands is hydrogen, R<sub>3</sub> on the ligand to the right of Ir in formula (V) is a hydrocarbyl group (also an aliphatic group), R<sub>4</sub> is a hydrocarbyl group (also an aliphatic group), and R<sub>2</sub> on the ligand to the right of Ir in formula (V) is a phenyl group.

Compound C is used to make a device having the structure ITO/CuPC/ $\alpha$ -NPB/CBP:Compound C/BCP/Zr<sub>q</sub>4/LiF/Al. See page 27, line 9-p. 28, l. 5 with reference to page 24, lines 6-12, p. 24, l. 27-p. 25, l. 20, p. 25, l. 28 and p. 26, l. 1 for further description of the device and the meaning of certain abbreviations. Although the prior art devices are described as photovoltaic devices, which have a different function than electroluminescent devices, it is the examiner's position that it is reasonable to expect that the prior art device having the structure

ITO/CuPC/ $\alpha$ -NPB/CBP:Compound C/BCP/Zr<sub>q</sub><sub>4</sub>/LiF/Al as described would be capable of functioning as an electroluminescent device. Prior art Compound C is an electroluminescent compound, and is present applicant's Compound J as depicted on page 28 of the present specification. The overall device structure is very similar to the structure of the electroluminescent devices described in the examples in the present specification. In particular, compare to present Examples 3, 4 and 5 on pages 29-30. Further, this prior art device has all the components required for the device as claimed in present claims 38-44 and 46-48. With respect to claims 41 and 46, CBP (which is used in the same layer as Compound C in the prior art device) is inherently capable of transmitting holes and electrons.

11. Claims 29-31, 35 and 38-48 are rejected under 35 U.S.C. 102(b) as being anticipated by Igarashi et al. (US 2001/0019782 A1).

Igarashi et al. disclose iridium complexes that are electroluminescent compounds represented by present formula (I) as within the scope of present claims 29-31, disclose a method meeting the limitations of present claim 35, and teach the complexes for use in electroluminescent devices as claimed in present claims 38-48.

See the iridium complexes represented by formula (1-22) on page 12, (1-45) on p. 14, and (1-64) on p. 16. Each of these meets the limitations of a compound per present claims 29-31.

With respect to the method of claim 35, see paragraph [0088]. Although Igarashi et al. do not provide a specific example of the claimed method, one of ordinary skill in the art at the time of the invention would have at once envisaged the presently claimed method given the

reaction scheme depicted in paragraph [0088] and the corresponding “L” ligands in the complexes of formulae (1-22), (1-45) and (1-64).

With respect to the device limitations of present claims 38-48, see paragraphs [0135]-[0149].

12. Claims 29-31, 35, 36 and 38-48 are rejected under 35 U.S.C. 102(b) as being anticipated by Thompson et al. (US 2002/0034656 A1).

The iridium complex of the formula shown in Fig. 29 of the prior art is a compound of present formula (I) as defined in claims 29-31, and is made by a method as claimed in present claim 35 (e.g. see paragraph [0196]).

The iridium complex of the formula shown in Fig. 31 of the prior art is a compound of present formula (II) as defined in claims 29-31. This prior art complex is made by a method as claimed in claim 36, presuming that the second formula in claim 36 should be depicted as encompassing reactants capable of providing complexes of the full scope of n (e.g. see paragraph [0197]).

Further with respect to the present method claims, also see paragraphs [0184]-[0187].

Thompson et al. disclose the complexes for use in electroluminescent devices. With respect to the device limitations of present claims 38-48, see paragraphs [0002], [0014], [0018]-[0020], [0023]-[0030], [0053], [0177]-[0183] and [0235]-[0240], and claims 69-73 and 75 of the prior art.

13. Claims 29-31, 35, 36 and 38-48 are rejected under 35 U.S.C. 102(b) as being anticipated by Lamansky et al. (US 2002/00182441 A1).

Complexes (b) and (c) as shown in Figure 1a of the prior art are electroluminescent compounds of present formula (I) as defined in claims 29-31. The complex (b) is prepared according to a method as claimed in claim 35 (see paragraphs [0070]-[0071]). One of ordinary skill in the art at the time of the invention also would have at once envisaged the corresponding dimer needed to make complex (c) according to the same general process.

The complexes represented by the formulae shown in Figures 9(a), 9(b), 9(d) and 9(f) are also electroluminescent compounds of formula (I) as defined in claims 29 and 31. These complexes are prepared according to a method as claimed in claim 35, presuming that the second formula in claim 35 should be depicted as encompassing reactants capable of providing complexes of the full scope of n (see paragraphs [0108], [0109], [0114] and [0115]).

The complex represented by the formula shown in Figure 9(e) is an electroluminescent compound of present formula (II) as defined in claims 29 and 31, and is made by a method as claimed in claim 36 (see paragraph [0113]).

Lamansky et al. disclose the complexes for use in electroluminescent devices. With respect to the device limitations of present claims 38-48, see paragraphs [0013]-[0018], [0096]-[0097], [0103]-[0104] and [0118]-[0124].

14. Claims 29-31 and 37-48 are rejected under 35 U.S.C. 102(b) as being anticipated by Igarashi (US 2002/0134984 A1).

Igarashi's iridium complexes represented by formulae (1-201), (1-202), (1-203), (1-212), (1-213), (1-214), (1-215), (1-217) and (1-218) as shown on pages 21 and 22 are compounds of present formula (III) as defined in claims 29-31.

With respect to the method of claim 37, the examiner presumes for purposes of this rejection that the second formula in claim 37 should be replaced with a formula representing a dimer having substituted or unsubstituted phenylpyridine ligands capable of providing the intended product. Igarashi's Synthesis Example 2 on pages 37-38 produces Igarashi's complex (1-203), which is within the scope of the intended product of the method of claim 37, and reacts a dimer having substituted phenylpyridine ligands with a compound of the third formula set forth in claim 37.

Igarashi's complexes are taught for use in an electroluminescent device. With respect to the device limitations of present claims 38-48, see paragraphs [0074]-[0097]. Also see the devices of Examples 4, 5, 7 on page 41, which are exemplary devices within the scope of present claims 38-42 and 46-48.

15. Miscellaneous:

In claim 31, "heterocyclic groups" is recited twice.

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Formulae (I), (II) and (III) as defined in present claims 29-31 encompass many electroluminescent compounds that were described in print more than one year prior to the effective U.S. filing date of the present application. The claimed methods (presuming corrections for consistency between the intended products and the described reactants) were also known and described in references published more than one year prior to the effective U.S. filing date of the present application. The present device claims utilize materials and multi-layered structures that were well-known in the art at the time of the invention.

The art that is applied in this action is representative of the prior art. There are numerous additional references that are relevant to the presently claimed subject matter, a few of which are listed on the attached PTO-892.

17. Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (571) 272-1531. The examiner works a flexible schedule but can generally be reached at this number from 7:00 a.m. to 3:30 p.m. Monday and Wednesday-Friday.

The current fax number for all official faxes is (571) 273-8300. (Unofficial faxes to be sent directly to examiner Yamnitzky can be sent to (571) 273-1531.)

/Marie R. Yamnitzky/  
Primary Examiner, Art Unit 1786

MRY  
September 26, 2010